Tau L3 Efficiency

Data Sample: we used gjet08 dataset and selected τ objects that pass standard cuts

L3 Matching: τ passes L3 if there is a L3TrackFilterModule track inside 10^0&|z|<10 (10^0 cone with |z|<15 cm from from the seed track)

Efficiency: number of L3 matched/total number of τs

Phase Space:

P_T^{-1} – obvious

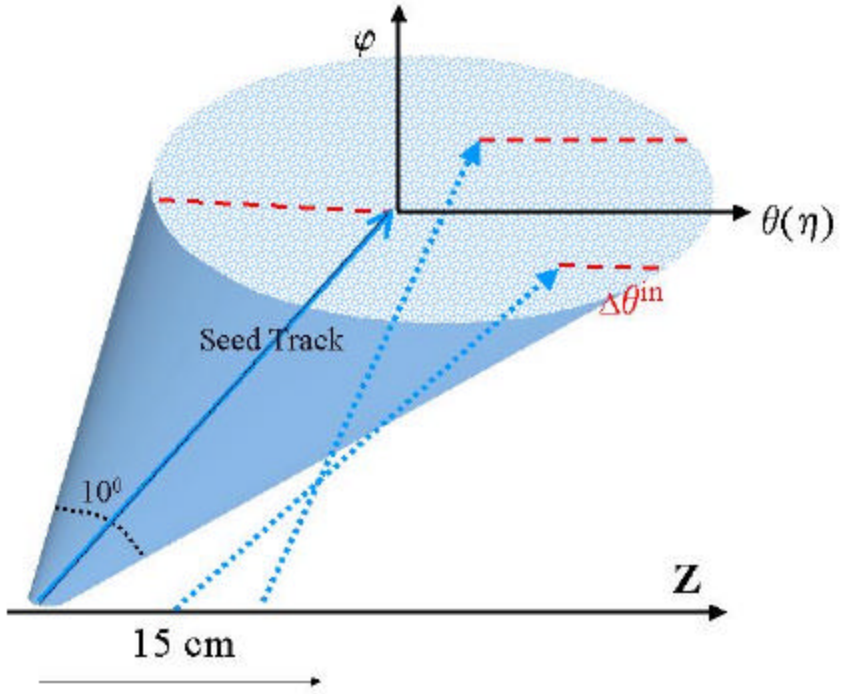
ΣP_T – sum P_T of all tracks that are inside $10\text{-}30^0_{\eta\text{-}\varphi}$&|z|<15

θ^{in} – closest θ angle between a track inside $10^0_{\eta\text{-}\varphi}$&|z|<15 and $10^0_{\eta\text{-}\varphi}$ cone

θ^{in} Definition

One of the inefficiency source is when L3 determines the angle to be in isolation cone while production does not. The closer the track to the border of isolation cone the more probable this to happen. θ^{in} is a measure of the how close tracks get to the isolation cone

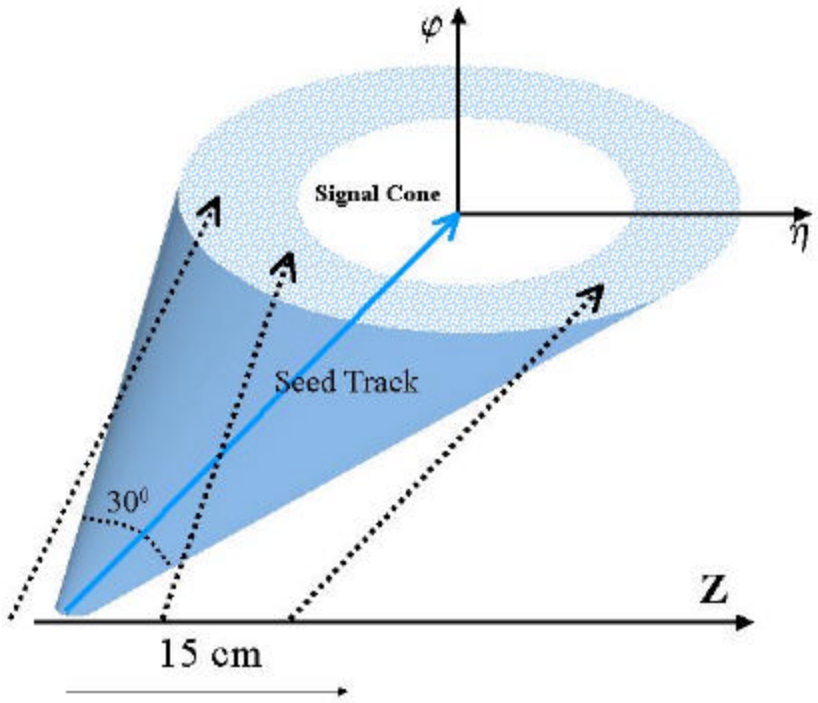
Why θ? The resolution is much worse in θ than in φ



We choose all tracks inside the signal cone with at least one COT hit and $P_T > 1.5$ GeV
And find the closest to The border

ΣP_T Definition

Another inefficiency source is when L3 measures the track in isolation cone momentum to be above 1.5 GeV while PROD thinks it is below 1 GeV. ΣP_T is a measure of activity in isolation cone.



We choose all tracks inside the isolation cone with at least one COT hit
And calculate ΣP_T

Procedure

Step 1: Fit each variable while selecting flat efficiency regions in other dimensions.

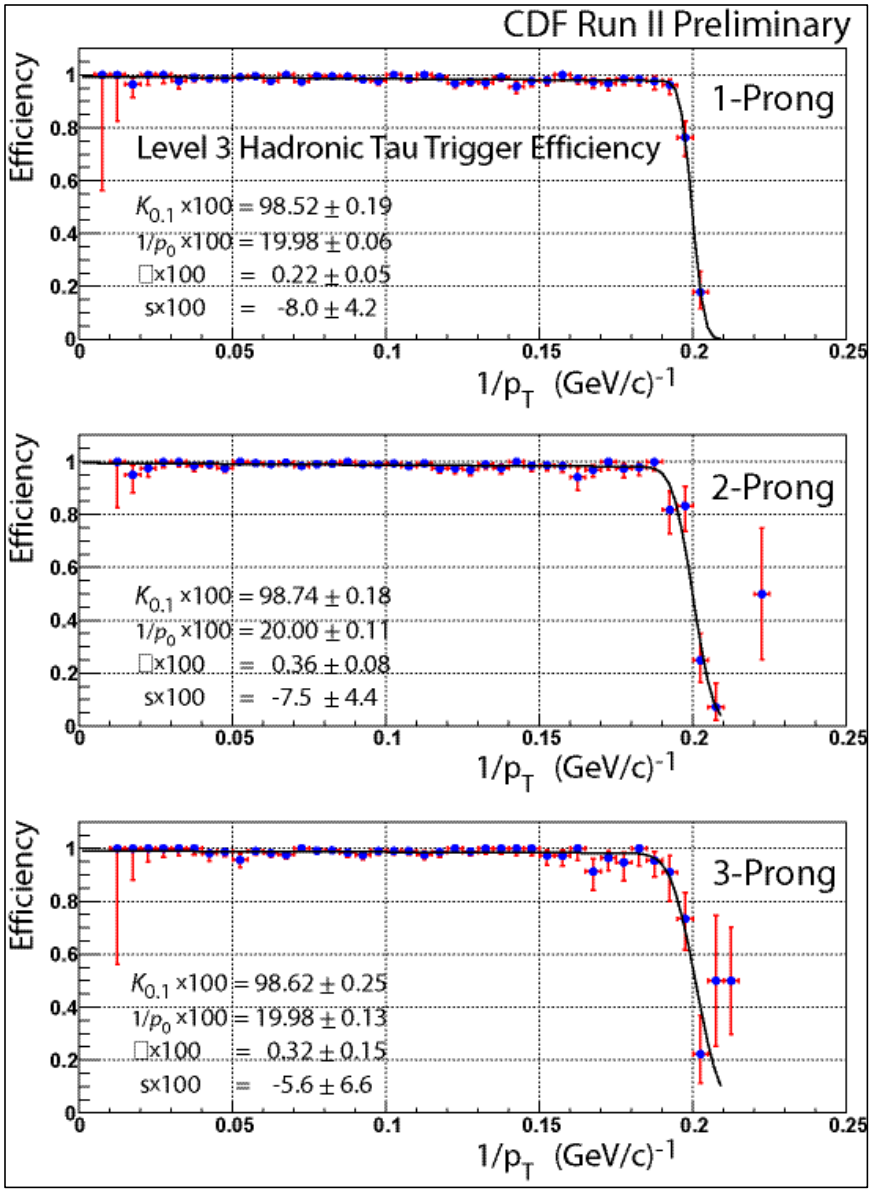
Step 2: Write the total efficiency as a product of all fit results. This uses an assumption that efficiency is uncorrelated between various dimensions.

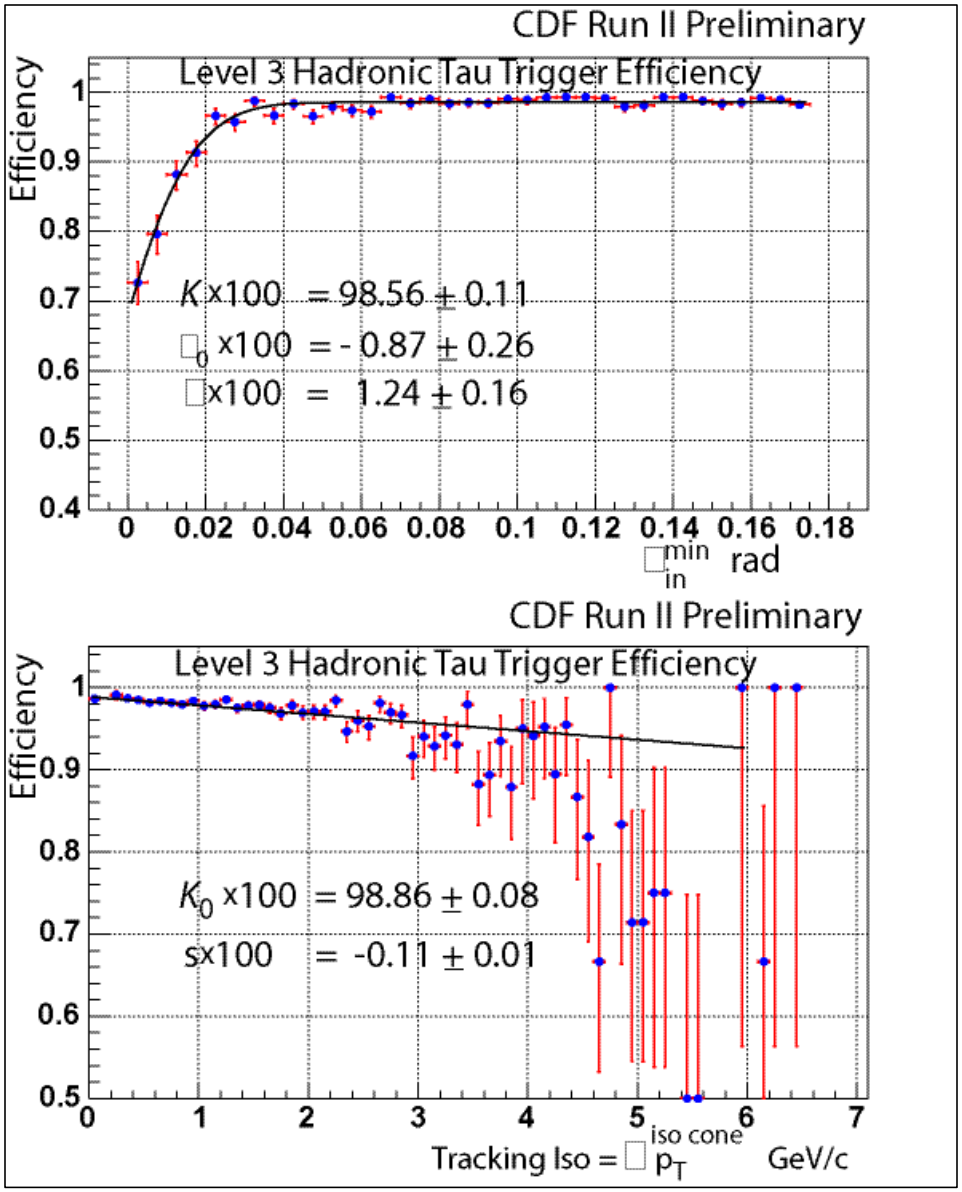
Step 3: Use the total efficiency formula to simulate the efficiency for events that passed offline cuts. Simulation – take all Tau events –> throw against the efficiency -> number of “matched to L3” Taus.

Step 4: simulated inclusive distributions with the data. If they agree, the assumption in step 2 is true, and the total efficiency is correct.

Results: Total Efficiency

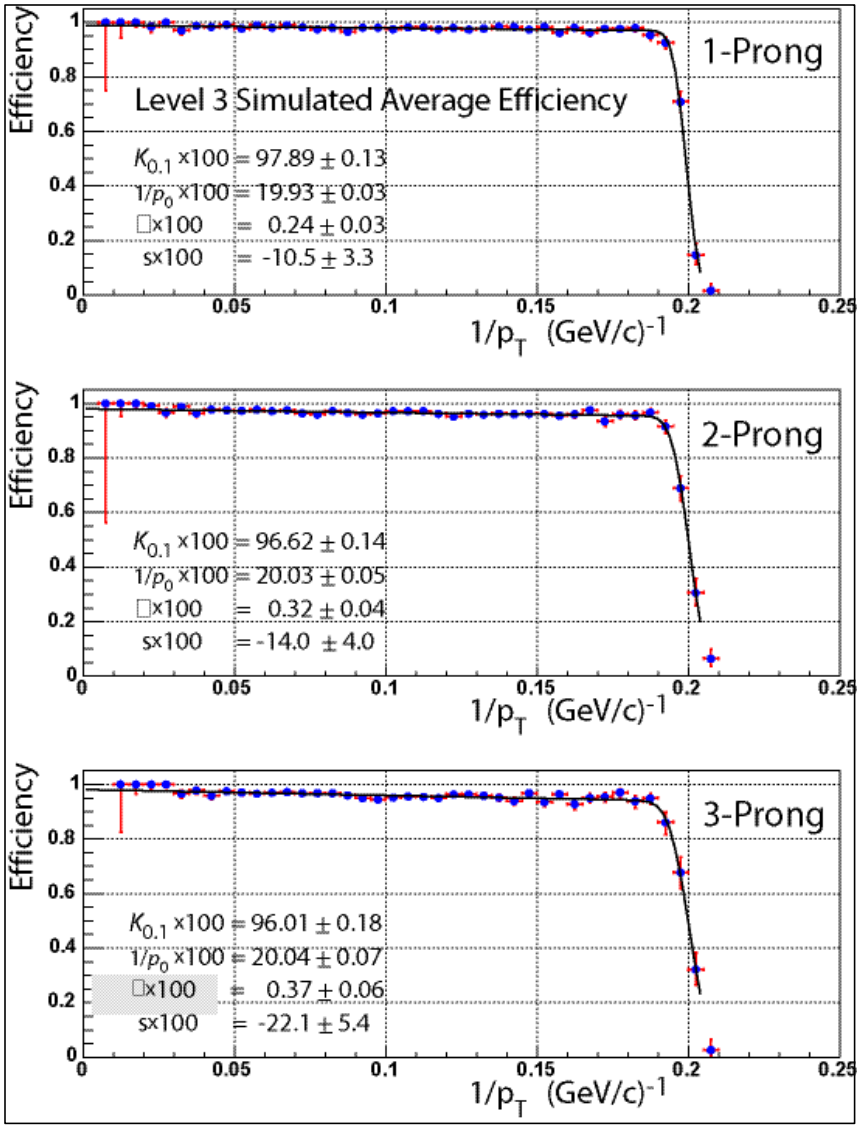
Efficiency cuts : $P_T^{-1}<0.18$ $\Sigma P_T<0.3$ $\theta^{in}>0.05$

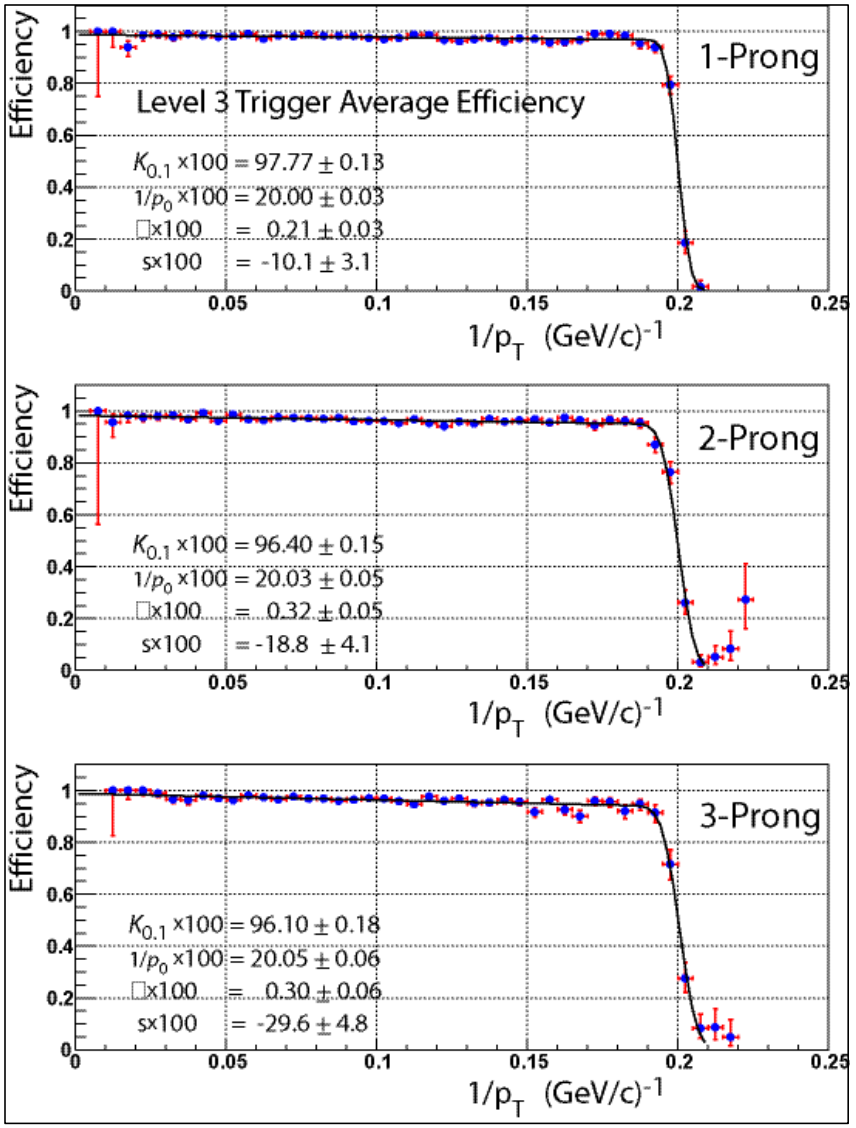




Inclusive vs. Simulated

There is only one overall normalization factor in total efficiency.
For each prong we have 7 parameters.





Plan

1. Put it all in the note
2. We showed everything with XFT efficiency, we will add numbers without XFT in the Appendix for the note.
3. We will check if selecting events with only 1 vertex changes anything -> Appendix.
4. Reproduce everything with new L3 code ->Appendix
5. Next time we will show studies on why we define variables as they are defined.
6. Have the script that does it all in one command line
7. Put all information on the web

Efficiency vs. Matching angle